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Seed Treatment of Irish Potatoes

EQUIPMENT FOR TREATING SEED POTATOES

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SEED TREATMENT OF IRISH POTATOES

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Irish potato seed treatment is of value not only in preventing scab, rhizoctonia, and black-leg on the tubers, but it is also an important means in improving the stand of healthy vines both early in the season and later towards digging time. Black leg (Fig. 5) is perhaps the most abundant of the diseases which affect the plants early in the season. Plants which are affected by this disease usually succumb before tubers of any size are produced. Where tubers are formed they frequently become affected with a watery decay produced also by the black leg disease. The results of rhizoctonia or black scurf, usually are apparent somewhat later in the season, when plants which are affected, may lose their green color and gradually die. In the case of both diseases the stems of the plants at and near the surface of the soil will be found girdled and partially or completely decayed. Poor stands resulting from black leg and scurf are frequently attributed to rainy seasons or unfavorable soil conditions, which in reality are only conditions favoring the development of the disease.

In addition to the above, practically all seed potatoes are grown in areas in which potato scab occurs. Seed potatoes frequently show scab lesions (Fig. 1), or they may bear the spores of the fungus which produces the disease, without showing definite lesions of scab. The disease is frequently carried to virgin soils or new planting areas by means of seed potatoes which are not treated before planting. Each season fields are of rather common occurrence in the State in which fifty per cent or more of the tubers are affected with scab.

FIG. 1.—Common scab of the Irish potato, a prevalent seed-borne disease.

The heavy expense involved in properly fertilizing and growing Irish potatoes makes it essential that only the best grade of seed potatoes be used for planting purposes. These should be regraded either before or at the time when they are cut into seed pieces in order to rid the seed of scurf, scab, and rot. Certified seed potatoes as a rule will be found most profitable for planting stock.

METHOD OF SEED TREATMENT

Until recently the only method of seed treatment consisted in dipping the seed in a solution of bichloride of mercury (1 to 1000), or of formaldehyde for a period ranging from 30 minutes to one and one-half hours. Under most conditions this method should still be used.

Within recent years, the manufacture of organic mercurials for seed disinfection has been undertaken by several chemical concerns with the result that one or more commercial disinfectants have received practical usage in some commercial areas. The commercial materials require only a one minute (instantaneous) dip which consumes considerably less time than the bichloride of mercury or formaldehyde treatments.

FIG. 2.—Plant affected with rhizoctonia and healthy plant growing in same hill. Diseased plant on left.

ORGANIC MERCURIALS VERSUS BICHLORIDE OF MERCURY

During 1927 and 1928, the commercial organic mercurials were used extensively in trials conducted both by a number of potato growers in North Carolina and also in several field trials conducted by the writer. The results of the tests conducted under the writer's supervision are given in tables 1 and 2.

The results secured in 1927 with the various treatments gave equally satisfactory control of disease in the various seed treatment tests. However, serious retardation resulted where the treatment was applied to home grown seed where commercial seed disinfectants were used. This injury did not occur where the treatment was applied to northern seed, as indicated in the tables, although a slight retardation was observed in the germination of northern seed in some of the plots where commercial disinfectants were used.

TABLE 1.—Potato Seed Treatment Tests, 1927

Plot No.	Treatment	Yield Bu. Per Acre	Percent Scab
	STATE HOSPITAL FARM, Goldsboro		
	Canadian Certified Seed		
1	Untreated	61.2	.....
2	Bayer Dipdust applied to cut seed	71.9	.....
3	Bichloride of mercury	67.2	.....
4	Semesan Bel applied to cut seed	72.1	.....
5	Semesan Bel (dust) applied to cut seed	66.6	.....
	A. H. OLIVER FARM, Goldsboro		
	Home Grown Scabby Seed		
1	Untreated	125.4	15.9
2	Bichloride of mercury	133.3	1.58
3	Semesan Bel, Cut seed	121.7	1.15
4	Dipdust, Cut seed	100.7	.75

In 1928 a similar lot of treatments was undertaken using both home grown and northern seed. Also treatments were made before the seed were cut, and after cutting in order to determine any differences which might occur from either method of treatment. The results secured in 1928 in general were in agreement with those secured in 1927, in that serious retardation resulted where the treatment was applied to home grown seed. Since home grown seed are slower growing and later maturing, this injury is apparently related to the slower rate of germination of the home grown seed as compared with those grown in colder climates. Sprouts are produced more readily by the northern seed at the time of planting, and it would seem likely that this difference in the rate of growth is related directly or indirectly to the injury resulting to home grown seed.

An examination of the results recorded in the tables will show that moderate increases in yields resulted in some instances where the organic mercurials were applied to uncut northern seed. The increases resulted regardless of a slight retardation occurring at germination time. While this increase cannot be explained entirely as resulting from disease control, it was observed that plants which showed a slight retardation at the time of sprouting, appeared to produce a greater quantity of potatoes if they were allowed to mature fully, than plants coming from untreated seed. These observations were in agreement with the yields secured in the field; namely, that early crop treated potatoes produce smaller yields than untreated, while general crop potatoes grown from treated seed and which are allowed to mature fully produce more potatoes where the seed are treated than those grown from untreated seed.

The results obtained in 1927 and 1928 indicate also the advisability of employing organic mercurials for treating seed only before they are cut in to seed pieces. In general it has been found that greater yields are secured where the treatment is applied to uncut seed than to cut seed, and injury is much more apt to result where the materials are used on cut seed pieces.

TABLE 2.—POTATO SEED TREATMENT TESTS, 1928

Plot No.	Treatment	Yield Bu. Per Acre
	STATE HOSPITAL FARM, Goldsboro	
	Canadian Certified Seed	
1	Semesan Bel, before cutting	118.5
2	Untreated	102
	Maine Certified Seed	
3	Semesan Bel, before cutting	120.2
4	Untreated	115
	Canadian Certified Seed	
5	Untreated	120
6	Semesan Bel, before cutting	144
7	Semesan Bel, after cutting	130
8	Untreated	129
9	Dipdust, before cutting	156
10	Dipdust, after cutting	132
11	Untreated	144
	J. D. BRANDON FARM, Mt. Olive	
	Home Grown Seed	
1	Dipdust, after cutting	37.2*
2	Semesan Bel, 24 hours after cutting	67
3	Untreated	76.8
4	Dipdust, 24 hours after cutting	53.5

*Yields in baskets per acre.

THE BICHLORIDE OF MERCURY METHOD

The method for treating seed potatoes with bichloride of mercury is as follows: Prepare the treating solution in the proportion of 4 ounces of bichloride of mercury (corrosive sublimate) to 30 gallons of water. A small quantity of hot water should be used first to dissolve the corrosive sublimate because the chemical dissolves in cold water very slowly. Corrosive sublimate is a violent poison when taken internally and hence it must be kept out of the reach of children and animals. The solution must be prepared and used in wood, enamel or concrete containers because it corrodes metal. Wooden barrels are convenient for this purpose.

Seed are treated before being cut, and before they have sprouted to any extent. The potatoes are dipped, usually in sacks, into the solution for a period of from one to one and one-half hours. If the potatoes are sprouting considerably, it is advisable to confine the treatment to the one hour period or if it appears advisable the treatment may be reduced to 30 minutes. Treated potatoes are fit for planting purposes only, since poison is absorbed by the corky skin.

Corrosive sublimate solutions grow weaker rapidly from use. When treating a large quantity of potatoes, it is advisable to add an ounce of dissolved corrosive sublimate to each barrel after treating each batch of potatoes, and also enough water to bring the solution up to its original volume. This may be repeated four times, after which the disinfectant may be used twice more, and then, because the composition of the old solution has become uncertain, it is best to discard it and prepare a new one.

If formaldehyde is used instead of bichloride of mercury, prepare a solution in the proportion of one pint of formaldehyde to 30 gallons of

water and treat for the same length of time as where bichloride of mercury is used. Formaldehyde does not grow weaker from use and on this account the same solution may be used for several days. Formaldehyde solutions become stronger rather than weaker due to the evaporation of water. On this account formaldehyde treating solutions should not be left exposed to the air for several days without replenishing the water lost by evaporation.

FIG. 3.—Potato showing the dark sclerotia or resting bodies of the rhizoctonia (black scurf) disease. These are masses of fungus threads which enable the parasite to live over winter and attack the roots and stems in the spring. This disease is preventable by seed treatment.

FIG. 4.—Plant affected with rhizoctonia. Note decay of stem and small potatoes on the main stem and branches. Seed treatment will eliminate this disease.

SUMMARY OF RECOMMENDATIONS CONCERNING SEED TREATMENT

Seed Irish potatoes should be treated before planting to reduce troublesome seed-borne diseases, such as scab, rhizoctonia, and black-leg. Where home grown seed are planted, or where northern seed are planted for early crop potatoes, the standard bichloride of mercury or formaldehyde treatments described in this circular should be used. At present the use of commercial organic mercurials produces sufficient retardation in the maturity of the crop, to make their use on early crop potatoes unsafe.

Where organic mercurials are used on general or late crop potatoes, which are not dug until full maturity, the treatment applied in accordance with the manufacturers' directions to northern seed for general crop potatoes is safe, and appears to produce no reduction in yield. Satisfactory disease control resulted from all of the treatments used in the tests. In some instances the organic mercurials when applied to northern grown seed produced increased yields where the potatoes were allowed to mature and were grown as general crop potatoes. In the case of early

crop potatoes, however, where earliness of maturity is of importance, the probable danger of retardation from organic mercurials, so far, has made the use of these materials inadvisable for early crop potatoes. Where general crop potatoes are slightly retarded in germination by organic mercurials, and are allowed to grow to full maturity, fields so affected produce more potatoes when fully matured, than crops grown from untreated seed.

FIG. 5.—Potato black leg. Plants affected with this disease show a black, watery decay of the stem often early in the season. The disease is seed transmissable and can be prevented by seed treatment.

The results secured in North Carolina indicate the inadvisability of using any treatment other than the standard bichloride of mercury or formaldehyde seed treatments on home grown seed, regardless of whether grown for early crop or general crop. Home grown seed, which are slower in sprouting appear to be much more subject to injury by seed disinfectants.

Under all conditions it has been found advisable so far to practice seed treatment only before potatoes are cut into seed pieces. Seed potatoes which have been cut into seed pieces are much more subject to injury than the uncut seed. On this account it is recommended that seed treatment be practiced after the seed have been regraded to eliminate diseased seed stock, and before they are cut into seed pieces for planting.